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CAN WATER EXTINGUISH THE FLASH POINTS OF THE  
MIDDLE EAST?

by

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*Abstract*

This paper will examine some of the many factors which are currently influencing events in this area. Most of these factors have been relevant for a considerable period of modern as well as ancient history and portend to be factors well into the future. In an area that has been experiencing difficulties with water shortages for generations, we will review the explosive population growth that is expected over the next one to two decades. We will look at rivers which are the principal sources of water in this area which cut across numerous international borders. We will discuss major aquifers which are virtually ignored by any type of international guidelines. We will observe that the international organizations that one might expect to see set up to administer this critical natural resource or provide basic guidelines from international law are virtually non-existent. We will also discuss a number of engineering proposals that have been proffered to address the water shortage in the area. We will discover that while the engineering challenges of many of these projects are truly daunting, the potential payoffs are quite significant. Unfortunately, these projects are virtually stillborn due to ancient animosities and distrust. We will then review the few engineering projects that are underway or completed in the region and see a lack of system level planning that is frightening from its potential to increase tensions and spark water-based conflict. We will discover that a fixation with total independence from any neighbor will lead to such unimaginable events as the squandering of a desert nation's fossil water in order to become a net exporter of grain

that costs four times the world market value to produce. Finally, we will entertain a few strategic observations concerning the likelihood of progress concerning this most crucial of resources in one of the world's most volatile areas, and discuss the implications for US national security policy.

## **Chapter 1**

### **Introduction**

When we think about the potential for further conflicts in the Middle East, the source of the conflicts most often centers on oil. While the Middle East is clearly a volatile area with major deposits of this critical natural resource, this paper will examine the potential for an even more fundamental natural resource to be the leading source of conflict—water. As an area possessing two of the four major river valleys from which modern civilizations sprung, the Middle East has a level of cultural, ethnic, religious, political, and national diversity that makes the rest of the world appear almost homogeneous by comparison. This same diversity is leading to increasing strain and contention over these life-giving river systems.

This paper examines some of the many factors which influence events in this area. Most of these factors have been relevant for a considerable period of modern as well as ancient history and portend to be factors well into the future. In an area that has been experiencing difficulties with water shortages for generations, we will review the explosive population growth that is expected over the next one to two decades. We will look at rivers which are the principal sources of water in this area which cut across numerous international borders. We will discuss major aquifers which are virtually ignored by any type of international guidelines. We will observe that the international organizations that

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We will discover that a fixation with total independence from any neighbor will lead to such unimaginable events as the squandering of a desert nation's fossil water in order to become a net exporter of grain that costs four times the world market value to produce.<sup>1</sup>

Throughout the paper an attempt will be made to maintain a systemic focus on the issues at hand, for without such a focus individual challenges may appear tractable by approaches that would not survive exposure to the realities of the whole region.

After our review of some of the technically ingenious alternatives for increasing the availability of water within the region, we will attempt to balance their promise with discussions of some of the evolving literature on the potentially devastating environmental repercussions of major ecosystem modification projects. Finally, we will entertain a few strategic observations concerning the likelihood of progress toward management of this most crucial of resources in one of the world's most volatile areas, and discuss the implications for US national security policy.



### Notes

<sup>1</sup>Priit J. Vesilind, "Water, The Middle East's Critical Resource," *National Geographic* 183 (May 1993): 57.

## **Chapter 2**

### **Future Event Drivers**

Population, water supply, and methods for obtaining additional water are the fundamental material factors that will drive events in the region for the foreseeable future. As the paper evolves we will also posit that individual and governmental attitudes of mistrust are equally important determinants of regional events.

#### **Population**

Projections for near term increases in population for the Middle East are nothing short of staggering. The Nile River valley, which was the center of a rich and prosperous civilization during the time of the Pharaoh Kings, was never required to support a population that exceeded 1.5-2.5 million. Today the population along the Nile River valley is approaching 60 million and is projected to exceed 100 million within the next 15 years.<sup>1</sup> The Jordan-Yarmuk and Tigris-Euphrates riparian nations are also projecting populations to basically double within 20-25 years. The stress such population levels will place on a region that was once the bread basket of Europe will require the intensive application of engineering skills, and a level of cooperation amongst peoples of the region, here-to-fore unseen. The only exceptions to the extreme population growth areas appear

to be Israel and Turkey, which are projecting growth rates approximately half those of their neighbors.

An additional spike in the population growth of Jordan after the Gulf War was the result of a major migration of Palestinians from Kuwait. In Israel the continued religiously motivated movements on the part of the world's Jewish peoples is responsible for much of the population increase. The largest contribution to the increasing population, however, comes from the indigenous population for whom there are also religious and economic influences which argue against a Western "zero population growth" mentality. The traditional Islamic inclination towards large families, as well as the economic inducements for numerous children as a substitute for a financial social security program, pose major impediments to reducing population growth rates. Thus, while the explosive population growth projected for the area is clearly the major forcing function that will drive the system, a near-term means of mitigating this force is not readily apparent. This leads to the less efficient approach of increasing the supply of a scarce commodity.

### **Sources of Water**

Despite the explosive population growth projected for the countries of the Middle East, and despite the promise of technological solutions such as desalination, the story of water in the Middle East remains the story of four rivers: the Jordan-Yarmuk, the Nile, the Tigris, and the Euphrates, and a few major aquifers. The rivers share two characteristics which are fundamental to our topic. First, the water in each of these rivers is virtually exhausted, in both quantity and quality, by the time they empty into their respective seas.

Second, the yearly volume of water in each is highly variable, which significantly complicates planning for their conservation and distribution.

The Jordan-Yarmuk River flows through Jordan, Syria, Lebanon, and Israel.<sup>2</sup> The Jordan River is currently providing 50 percent of the water used by Israel and 75 percent of the water used by Jordan. Israelis take 75 percent of the Jordan River water that reaches the Sea of Galilee and channel it to the rest of the country through the National Water Carrier. The Kingdom of Jordan diverts the waters of the Yarmuk—the Jordan's main tributary—into its water carrier, an open concrete flume called the King Abdullah Canal, which loses approximately 50 percent of its water to evaporation and poor maintenance.<sup>3</sup>

The Nile River provides 97 percent of Egypt's water and flows through eight nations: Ethiopia, Sudan, Tanzania, Uganda, Kenya, Zaire, Burundi, and Rwanda before it enters Egypt. Since 1971, the annual flooding of the Nile Valley has been controlled by the Aswan High Dam.

The Tigris and Euphrates Rivers flow out of Turkey through Syria and Iraq before emptying into the Persian Gulf. Turkey is the one country in the area that has a surplus of water. It is not, however, distributed in a fashion consistent with the development plans of the nation.

In addition to the rivers of the Middle East there is also a considerable amount of water available from aquifers which underlie significant portions of the area. Underground aquifers in Jordan, Israel, and the West Bank account for approximately 60 percent of the sub-region's total water supply. Three aquifers—northern, eastern, and western—lie beneath the West Bank. The water is tapped by wells sunk by the British during the

period after the First World War when Palestine was a protectorate of the British Empire under auspices of the League of Nations. These wells are on land that is within Israel's pre-1967 borders. Israel now gets some 40 percent of its water through these wells, but in so doing it takes about 85 percent of the annual recharge of the western aquifer.<sup>4</sup> In order to protect this vital source of water, the Israelis, fearful of overtaxing the aquifer, have prohibited the Palestinians of the West Bank from sinking any new wells without a permit. A mounting source of hostility in the region is the paucity of permits that have been issued. The issue of access rights to this water is typical of the complexities of the Middle East as the rain falls in Jordan, but is "released" through the wells in Israel.

### **Engineering Projects**

In order to alleviate the water shortages in the region, a number of engineering projects have been initiated and additional projects are in various stages of consideration. The most significant regional project is Turkey's Southeast Anatolia Development Project (GAP).

GAP has been compared in scope, complexity, and regional impact to that of the Tennessee Valley Authority. The project was originally proposed by the Turkish government in 1936.<sup>5</sup> When completed it will consist of 15 major dams, 14 hydroelectric power stations and 19 irrigation projects. One dam, the Ataturk, is the fifth largest in the world, capable of irrigating more land than possible by any other single impoundment. The project will double hydroelectric capacity in Turkey, and irrigate two million hectares. This will make Turkey self sufficient in electrical power and will increase the irrigated area in the country by 66 percent.<sup>6</sup> Construction was initiated on the Ataturk Dam in 1981 and

initial constriction of the river to initiate filling of the lake occurred in 1990. Part of the ecological and social impacts of GAP was the flooding of thousands of square kilometers of land and the associated displacement of the occupants. The region is heavily populated by Kurdish people who have long been a source of political agitation within Turkey. The regions that have been selected for resettlement are near the city of Konya in south central Turkey and a southwestern region near the Aegean Sea.<sup>7</sup> The social fallout of the resettlement will be unfolding for some time to come.

In 1987, Turkey proposed two "Peace Pipelines" which could supply critically important fresh water from the Seyhan and Ceyhan rivers in the Adana region. The dual pipelines would deliver potable water to millions. The western pipeline would supply water to Israel, Jordan, Syria, and western Arabia. Its eastern counterpart, drawing on waters of the Euphrates and Tigris could be extended south of Iraq to refresh the states of Kuwait and Oman via Saudi Arabia. Feasibility studies indicate that such a project could be completed at about half the cost of desalination.<sup>8</sup> Few nations were receptive, and the concept sits in limbo.<sup>9</sup> The lack of interest in this proposal will be addressed again later in the paper.

A number of proposals have been made to take advantage of the potential energy provided by the elevation differential of the Dead Sea as a means of producing hydroelectric power in the region. In the early 1990s a team of Israeli engineers developed a plan to couple the production of electricity with the powering of desalination plants to address the areas water shortage. The plan would take water from the Mediterranean across Israel in a seven-mile concrete lined canal and a twenty-mile tunnel to drop into the Dead Sea. The energy released in the 1,200-foot drop would provide

power for desalination. This proposal appears to have languished in the political arena, and is only infrequently referenced.<sup>10</sup>

On the other hand, King Hussein of Jordan is promoting a plan that would utilize water from the Red Sea which seems to be gathering political momentum. The Jordanian proposal envisions a 168-mile canal from the Red Sea to the Dead Sea. From the port of Aqaba, Red Sea water would be pumped northward along the Israeli-Jordanian boundary. About 62 miles north of Aqaba, the canal would reach an elevation of about 660 feet above sea level on Mount Deom. From there it would begin the 2,000-foot descent toward the Dead Sea, which at 1,335 feet below sea level is the lowest surface point on Earth. The approximate 35 billion cubic feet of water charging down the valley would generate electrical power to drive the biggest desalination plant in the world. About 40 percent of the Red Sea water would become fresh water and the leftover brine would be poured into the Dead Sea.<sup>11</sup> Current estimates show the depth of the Dead Sea has been reduced by 60 feet since the 1960s. The depositing of brine into the sea should restore its size to that of 40 years ago. Subsequent efforts would be directed at maintaining an equilibrium between the quantity of water deposited in the sea and the amount lost to evaporation. As the Arava Valley, through which the water would be pumped, is largely uninhabited, there have also been plans developed to construct water-based recreational facilities, and fisheries along the route of the water flow. A World Bank feasibility study of the project was released the week of the Israeli-Jordanian peace accord signing. With a \$3-4 billion price tag, funding is still an issue, but both Jordan and Israel appear to support the project.<sup>12</sup>

In another sub-region of the Middle East, the Jonglei Canal in the Sudan is an effort to increase the flow rate of the Nile into Lake Nasser. The White Nile flows into the Sudd, a vast relatively flat region, where it meanders in flooded grasslands, swamps, and small streams prior to continuing its journey towards the Nile. There are estimates that during its wanderings the river loses up to 50 percent of its water to evaporation and transpiration. While first proposed in 1904, construction on the 360-kilometer canal did not begin in earnest until 1978. With approximately 100 kilometers remaining, the project was abandoned in 1983 due to the outbreak of civil war in Sudan. When the civil war is resolved in Sudan, Egypt can be counted on to quickly raise the issue of completing the canal.<sup>13</sup>

Taking a different approach to an engineering solution, a company in Canada has designed a method of shipping water in giant plastic sacks called Medusa Bags. The bags, each the size of two super tankers, would hold some 400 million gallons of fresh water. Since fresh water is lighter than salt water, they would float well enough to be towed across the Mediterranean from terminals in Turkey to the Israeli coast, at a cost per gallon less than that of desalinization.<sup>14</sup>

### Notes

<sup>1</sup>Daniel Hillel, *Rivers of Eden: The Struggle for Water and the Quest for Peace in the Middle East*, (New York, Oxford University Press: 1994), 63.

<sup>2</sup>Peter H. Gleick, "Water, War & Peace in the Middle East," *Environment* 36 (April 1994): 9.

<sup>3</sup>Bruce Stutz, "Water & Peace," *Audubon* 96 (September-October 1994): 68.

<sup>4</sup>*Ibid.*, 68.

<sup>5</sup>Avonna Kessler Swartz, "Changing the World Around Them: A Letter from Turkiye's Harran Plain," *Social Education* 56 (January 1992): 6.

<sup>6</sup>John F. Kolars and William A Mitchell, *The Euphrates River and the Southeast Anatolia Development*. Carbondale: Southern Illinois University Press, 1991. [book review by Will D. Swearingen, *The Geographical Review* 83 (January 1993): 94].



## Notes

<sup>7</sup>Swartz, 6.

<sup>8</sup>John F. Kolars and William A Mitchell, *The Euphrates River and the Southeast Anatolia Development*. Carbondale: Southern Illinois University Press, 1991. [book review by Howard A. Reed, *Middle East Journal* 46 (Winter 1992): 115].

<sup>9</sup>Vesilind, 50.

<sup>10</sup>Irwin Ploss and Jonathan Rubinstein, "Water for Peace, an unlikely Mideast gambit," *The New Republic* 207 (Sep 7, 1992): 21.

<sup>11</sup>Sarah Helm, "Mideast Water Wars," *World Press Review* 42 (January 1995): 37.

<sup>12</sup>Fred Pearce, "Raising the Dead Sea," *New Scientist* 147 (22 July 1995): 34.

<sup>13</sup>Paul Howell, Michael Lock and Stephen Cobb, editors, *The Jonglei Canal: Impact and Opportunity*, Cambridge University Press, 1989 [book review by H.R.J. Davies, *Geographical Journal* 155 (November 1989): 405].

<sup>14</sup>Stutz, 104.

## **Chapter 3**

### **Impediments to Progress**

What stands in the way of progress in the water crises of the Middle East is not the actual availability of water, nor any lack of engineering talent to deliver the water where it is needed. What stands in the way of progress are international borders and all the distrust and ancient animosities that they engender—borders that were arguably set quite arbitrarily by the European powers in such secret agreements as the Sykes-Picot accord of 1916.<sup>1</sup>

The situation is complicated by the near total lack of international organizations, treaties, or even international law to guide agreements on the issues. As a result, the tremendous benefits to the region offered by concepts such as Turkey's "Peace Pipelines" are not realized. On an even more basic level, construction projects on the major rivers which will have a significant impact upon those downstream are not coordinated with the affected nations. There are only the most rudimentary agreements between nations concerning the prerogatives of the upstream nations to constrict flow to those downstream.

## **Borders**

As discussed previously, each of the four rivers crosses a number of international borders on its journey to the sea. The Nile flows through eight nations, The Jordan-Yarmuk flows through four, and both the Tigris and Euphrates flow through three. When coupled with the long-standing animosities of the region, these border crossings can significantly impact otherwise sound opportunities for improvement. The dual "Peace Pipelines" of Turkey are an excellent case in point. The "Peace Pipelines" would have taken what is essentially excess water from Turkey and distributed it throughout the region, but it generated little to no interest in the area. The lack of interest was largely attributed to the unwillingness to become dependent upon another nation for critical resources. "In this region," Turkish Foreign Ministry official Burhan Ant stated in Ankara, "interdependence is understood as the opposite of independence. Every country here seeks a kind of self-sufficiency in every field, because they don't trust the others."<sup>2</sup>

A similar situation had occurred in the late 1970s when Egyptian President Anwar Sadat offered a proposal to build a pipeline from the Nile River to the Israeli Negev desert as a demonstration of friendship. Many of the other countries along the Nile river objected as did many in Egypt, but possibly the most telling objections came from Israelis who believed it was dangerous to depend upon a former enemy for such a vital resource as water.<sup>3</sup>

## **Organizations**

On the Nile River, Egypt has organized discussions among riparians—a forum called the Undugu Group—and made a compact with Sudan in 1959 for a stable Egyptian quota

of water at the High Dam.<sup>4</sup> But Ethiopia, the source of 85 percent of the headwaters, is not a party to the Undugu talks, and none of the other seven nations was part of the original Egyptian-Sudanese agreement. When Ethiopia announced its intent to build a hydropower dam, the announcement rattled nerves in Cairo sufficiently that the Israeli engineers, who were assisting with the design, left the country.<sup>5</sup> Despite the end of the civil war in Ethiopia, which led to the formation of the newly independent state of Eritrea in May 1993, conflict continues in Ethiopia between armed civil factions as well as organized military operations into southern Sudan. Ultimately, the needs of the starving peoples of Ethiopia will rise above tribal warfare, and the development of another Nile River based agricultural economy will present challenges for Egypt.

A technical committee of the three Euphrates riparians—Turkey, Syria, and Iraq—has met intermittently to share hydrological information, but has made no real headway.<sup>6</sup> Turkish officials have expressed a willingness to enter into bilateral agreements with Syria, but have refused to enter into any trilateral agreements that would include stipulated minimum flow rates entering Iraq. The Turkish position is that they have no control over the water once it enters Syria. Thus, Iraq and Syria need to formulate agreements independent of Turkey.

Things are not significantly better in the Jordan River Valley. As far back as the 1950s, President Eisenhower sent his envoy, Eric Johnston, to devise a sharing plan for the Jordan River. Technical experts from all four riparians—Syria, Lebanon, Israel, and Jordan—accepted the resultant plan in principle. However, the actual quotas specified were not agreed to and the governments would not ratify the plan, as it would have required their acknowledgment of the state of Israel. The plan was abandoned, but Jordan

and Israel agreed to the specified quotas in return for US aid in financing a major water project in each nation.<sup>7</sup> In more recent times, informal meetings between Israeli, Jordanian, and even Palestinian authorities have occurred for a number of years; however, official negotiations have been plagued with problems. Israel maintains the rigid view that the loss of control over water is tantamount to the loss of land—thus, a risk to national security. For their part, the Arabs, Egypt apart, had refused to acknowledge the state of Israel as an official entity until 1994. This lack of recognition extended to entering into any signed agreements with Israel.<sup>8</sup> However, the October 26, 1994 Israel-Jordan Peace Treaty stipulations on water sharing between the two nations is based very closely upon the 1953 Johnston plan.

With regard to the GAP project, Turkish planning is occurring independently of equally ambitious plans in Syria and Iraq for the lower portions of the rivers. Unfortunately for the downstream riparians, GAP will expropriate the lion's share of the water flow.<sup>9</sup> Full development of the Anatolia project could reduce the Euphrates' flow by as much as 60 percent. This could severely jeopardize Syrian and Iraqi agriculture.<sup>10</sup> The relative trickle that will come into Iraq will be highly salinized and virtually useless.

Yet Turkey's GAP project is not the region's first instance of planning in a vacuum. Syria has its own large-scale Euphrates Dam at Tabqa. A Ministry of Irrigation official in Damascus stated that the water flow has been reduced to such a point that "Only two of the dam's eight turbines are working." However, he also went on to say that, "There has never been enough water for them all."<sup>11</sup> Thus, one has to question the planning assumptions that were used when the Syrians built their dam, as the GAP project had been proposed as far back as 1936.

## International Law

International Law is of limited assistance in complex issues relative to water rights. It is of even less assistance when the topic turns to aquifers. Current precedent seems to indicate that when nations share the same river, the upstream nation is under no legally binding obligation to provide water downstream. The only option available to the downstream nation is to claim historical rights of use and press for fair treatment.<sup>12</sup> In discussions regarding its access to the Jordan River and the limited residual flow below the Sea of Galilee, Israel cites accepted precedents and international law. Israel claims the same rights as those claimed by Egypt over the Nile's waters—which have withstood challenge and which give Egypt the right to object to any upstream dams in Ethiopia or Sudan. Syria makes the same claim on water from the Euphrates, which is the source of its objections to Turkish plans to control the downstream flow.<sup>13</sup> There is no indication of assistance forthcoming from the legal channels. Control of the aquifers under the West Bank is acknowledged as one of the perennial stumbling blocks in attempts to resolve this long-term problem.

## Notes

<sup>1</sup>Adam Garfinkle, *War, Water, and Negotiations in the Middle East: The Case of the Palestinian-Syrian Border 1916-1923*, (Tel Aviv Univ, 1993) [book review by Elizabeth Picard, *Middle Eastern Studies*, 31 (April 1995):404].

<sup>2</sup>Vesilind, 50.

<sup>3</sup>Hussein A. Amery, "The Litani River of Lebanon," *The Geographic Review* 83 (July 93): 229.

<sup>4</sup>Valerie Reitman, "Future Mideast Stability May Depend on Supply of Water Rather Than Oil," *Journal of Commerce and Commercial* 387 (February 22, 1993): 483.

<sup>5</sup>Vesilind, 67.

<sup>6</sup>*Ibid.*, 50.

<sup>7</sup>Vesilind, 59.

<sup>8</sup>Stutz, 104.

## Notes

<sup>9</sup>Kolars (book review by Swearingen), 94.

<sup>10</sup>Vesilind, 50.

<sup>11</sup>Ibid., 51.

<sup>12</sup>Ibid., 49.

<sup>13</sup>Stutz, 68.

## **Chapter 4**

### **History of Military Actions**

There is a long history in the region of military conflict and near conflict over water issues. In the 1950s, fighting broke out between Israel and Syria across the demilitarized zone, when Syria attempted to stop Israel from building its National Water Carrier system. When Syria subsequently tried to divert the headwaters of the Jordan River away from Israel in the mid-1960s, Israel used air strikes to take down the water diversion facilities. These military actions directly contributed to the tensions that led to the 1967 Arab-Israeli War with the subsequent occupation of the West Bank and control over much of the headwaters of the Jordan by Israel.<sup>1</sup> In the final stages of the 1967 War, the Israelis also shelled the Unity Dam site shared by Jordan and Syria on the Yarmuk River. In 1975 Syria and Iraq nearly went to war after the Iraqis dispatched troops to the Syrian border. The source of the disagreement this time was the sharp drop in the Euphrates River caused by Syria and Turkey beginning to fill reservoirs behind two new dams.<sup>2</sup> The one promising aspect of this latter incident was the attempt to involve the Arab League in the mediation of the situation. An agreement was reached through the good offices of the Saudi Arabian government. Additional water was made available to Iraq and open conflict was averted.



When Turkey was approached about turning off the water to Iraq during the Gulf War, it refused. Turkey stated that it will never use water as a weapon.<sup>3</sup> This is clearly a positive sign for the region, and indicates Turkish sensitivity to the threat that it poses to the independence of other nations, if it should become the water broker for the region. However, this Turkish sensitivity might be considered somewhat newly acquired, as only the year before Turkey had threatened to cut off water to Syria, if it did not cease fomenting discontent amongst the Turkish Kurds.<sup>4</sup> There was evidence that Syria was providing weapons and financial support to the Marxist Kurdistan Workers' Party (PKK) which seeks independence for the Turkish Kurdistan region. Syria hoped that the continued disruption in southeastern Turkey would inhibit the progress on GAP, and thus forestall any further reduction in the flow rate of the Euphrates. The recent incursion of a rather significant contingent of Turkish forces into Kurdish sanctuaries in Iraq may well give Damascus pause on pressing too far with this course of action.

Neither the Iraqis nor the Coalition Forces seemed to have any prohibition concerning the use of water as a weapon during the Gulf War. Most of Kuwait's extensive desalination capacity was destroyed by the retreating Iraqis, and the oil spilled into the gulf threatened to contaminate desalination plants throughout the region. The destruction of Baghdad's modern water supply and sanitation system by the Coalition Forces was so complete that the Iraqis are still suffering severe problems.<sup>5</sup>

#### Notes

<sup>1</sup>Gleick, 10.

<sup>2</sup>Vesilind, 51.

<sup>3</sup>Reitman, 483.

<sup>4</sup>Gleick, 13.

<sup>5</sup>"Iraq's Water Systems Still in Shambles," *U.S. Water News*, October 1992.

## Chapter 5

### Environmental Considerations

The environmental impacts of the water situation in the Middle East are both personal and society-wide. Due to a shortage of water in areas like the West Bank and Iraq, waterborne diseases—typhoid, cholera, amebic dysentery—have spread. When untreated sewage water is used to irrigate vegetables, cholera can break out as it did in 1989.<sup>1</sup>

At the regional level it is at least disquieting to learn that in an area of considerable seismic activity, Turkey's Southeast Anatolia Development Project (GAP) rests along one of the country's most active fault zones.<sup>2</sup> Studies of similar dam sites in India, which are under construction or being considered for construction in seismically active areas, have generated considerable debate regarding the safety of such construction. The advisability of such projects and the adequacy of current design methodologies are still hotly debated within the civil engineering community.<sup>3</sup>

We are also constantly reminded of the complexities of the environment, even when we set out to do what has become technically routine. In the 1950s, the Israelis drained Lake Huleh and the marshes that surrounded it. They diverted the Jordan into canals that ran around their newly created fields. However, draining the Huleh marsh exposed a thick layer of peat that proved ruinous to the grand agricultural scheme. Attempts to grow crops ended in disaster. The nitrogen in the peat poisoned the grain. When the peat dried,

winds blowing through the valley kicked it up in a toxic dust. Then the dried out peat bogs began to ignite spontaneously into fierce underground fires that were extremely difficult to extinguish. As a result of these unexpected consequences, the farmers are being persuaded to reflood at least part of the area.<sup>4</sup>

The work by Daniel Hillel on the environmental impact of major water projects in the Middle East provides further pause.<sup>5</sup> While those with a fascination for technical approaches to the world's problems are in awe of such engineering feats as Egypt's Aswan High Dam and Turkey's Ataturk Dam, the reaction of the world's ecosystem to such intrusions can be even more awe inspiring.

The Aswan High Dam is currently collecting 120 million tons of silt each year as part of the yearly run off. This is the soil that for literally millennia enriched the shores of the Nile River Valley and made the land so abundantly fertile. Without that annual deposit of new enrichment, farmers have had to turn to chemical fertilizers. These fertilizers find their way down river in the form of field run off and degrade the soil with chemical buildup. Heavy irrigation also leads to a buildup of salt in the soil which destroys fertility.<sup>6</sup> Prior to the construction of the dam, the natural flood cycle of the Nile would not only deposit silt that formed the basis of the rich farmland along the shoreline, but the rapid rise and fall of the river would provide a self-leaching action in which the accumulated salt in the soil would be washed away. Now that the river is maintained at an artificially high level throughout the year, the water table in the region has risen bringing the salt closer to the surface. When coupled with the lack of leaching action from the floodwaters, the result is a constant buildup of salt in the once fertile soil. In addition, the containment of

the silt by the dam has eliminated the yearly renewal of the delta region, leading to its erosion as well as the decline in the fertility of the delta soil.

A recent decision in the US to have a controlled opening of Colorado River containments to restore the flow of significant quantities of water and accompanying silt may be worthy of careful observation by the Egyptians. Similar controlled releases offer the potential for a solution to current irrigation, soil saline buildup, and loss of fertility problems in Egypt.

In addition to these, (what I will call) first order effects—so deemed because they are relatively easy to foresee and to understand; there are also a number of what I will call second order effects that are becoming more apparent. Among these is the sinking of the pyramids, and the infestation of the population with a formerly rare, but deadly bacteria in near epidemic proportions. It seems obvious once scientists explain that all the water stored in Lake Nasser must go somewhere; that is, that water that does not evaporate—an average 20 million gallons per day. The water seeps into the ground and makes it waterlogged, thereby diminishing its capacity to support heavy structures, e.g., the pyramids. In traveling underground the water also comes in contact with a snail known to be a carrier of a deadly bacterium. When the water reappears above ground in streams or is pumped out of wells, it brings the bacteria with it. Daniel Hillel refers to the major irrigation projects as grandiose engineering schemes based on “one dimensional science” and “linear logic.” He points out that the historic annual pulsation of the water table due to flooding created an automatic self-leaching cycle in which the salts were flushed away by the Nile itself.<sup>7</sup>

The root cause of conflict in the Middle East, Hillel argues, is the destruction of the region's traditional way of life through ill-fitted modernization and environmental degradation. Unable to sustain their traditional lifestyles and the ecological methods of farming, millions of farmers and rural folk are displaced from their land. They gather in overcrowded cities without infrastructure, adequate housing, sanitation or employment. The resultant deprivation and bitterness breeds extremism. The situation is made worse, Hillel argues, by the precarious nature of the Middle Eastern states, which were deliberately designed as unstable systems by the European powers. The Kurds, for example, were divided between three different counties and much of Lebanon was consciously handed to the minority Christians.<sup>8</sup>

#### Notes

<sup>1</sup>Vesilind, 51.

<sup>2</sup>Swartz, 7.

<sup>3</sup>Fred Pearce, "The Dam that Should Not be Built," *New Scientist* 129 (26 Jan 1991): 37.

<sup>4</sup>Stutz, 72.

<sup>5</sup>Daniel Hillel, *Rivers of Eden: The Struggle for Water and the Quest for Peace in the Middle East* (New York: Oxford University Press: 1994), 220.

<sup>6</sup>Vesilind, 69.

<sup>7</sup>Daniel Hillel, *Rivers of Eden: The Struggle for Water and the Quest for Peace in the Middle East*, Oxford University Press: 1994 [book review by Ziauddin Sardar "Cruising for Peace" *Nature*, 9 February 1995): 483].

<sup>8</sup>*Ibid.*, 484.

## **Chapter 6**

### **Uses or Misuses of Water**

When one starts to investigate a situation as complex as water in the Middle East, it is an easy task to overlook the forest for the trees. Clearly, one starts off with the basic perception of the region as one that is at least semi-arid if not actual desert. These perceptions are quickly re-enforced by a few staggering statistics on the paucity of rainfall in the area. We are then swept up by the even more staggering statistics that attempt to relay to us the significance of the ongoing, and apparently unstoppable, population explosion in the area. Clearly the lack of rainfall and the meteoric rise in population are compelling motivators for finding additional water supplies for the area.

Enter the technologically challenging, but clearly achievable, major engineering projects of the 21st century to the rescue. Granted, researchers like Daniel Hillel have identified some rather compelling environmental drawbacks, but still these just pose a greater challenge to the scientist in us all. In fact, we have been so thoroughly swept away with all the details and compelling social, economic, political, and technical challenges that we may understandably have overlooked a basic question—why?

Each and every country in this region is looking for significant increases in their current water supplies, not so that their people will have enough water to drink, and maintain basic sanitation conditions and systems. No. They want to turn their arid region

into a farming paradise. Yet agriculture based on irrigation is by far the most ravenous consumer of water. Adding to the consumption rate is the poor infrastructure and inadequate maintenance of irrigation systems such as that in Jordan, which loses nearly 50 percent of its water to leakage and evaporation prior to irrigating the crops.<sup>1</sup> On the most high tech side of the issue—the sensor laden, computer driven, “drip irrigation” technology of the Israelis—technology reduces the water consumption to 30 percent of the old-fashioned “flood” irrigation methodology. While this is obviously a significant improvement, the magnitude of the current water deficit, coupled with existing soil salinity, and the prospects of tremendous population expansion in the region, it is clear that “drip irrigation” will not completely solve the problem. Once again, stepping back from the specific technology enhancements, we are reminded that agriculture consumes 73 percent of Jordan’s water. But in Israel, agriculture still consumes 70 percent of the water, employs 2.7 percent of the people and produces 4 percent of the GNP.<sup>2</sup>

One has to wonder what is going on. A substantial case can be made that significant investments would have to be made in construction and education programs to elevate the farming technology in all of this area to that currently displayed by Israel. One then has to ask for what purpose and for what time period. One of the unfortunate side-effects of irrigation is the pollution of down stream soil. Much of Iraq’s once fertile soils have already been poisoned by salt deposits, which is the typical fate of “down stream” lands. Thus massive investments will be made to provide water for uncharacteristic farming methods that will in relatively short order, i.e., within two generations, destroy the very industry that was being built up. And finally, even with the efficiencies of the Israeli

system, the resultant agricultural products are not economically competitive on the world market even at a market stand in Haifa.

#### Notes

<sup>1</sup>Stutz, 68.

<sup>2</sup>Ibid., 70.



## **Chapter 7**

### **Observations**

Attitudes are the critical issue in the Middle East. Science and engineering can provide environmentally sound access to additional water, but age-old animosities must be overcome. The opportunities offered by the only nation in the area with excess water, Turkey, through its "Peace Pipeline" proposals should be examined closely by the nations in the area. For real progress to be made the examination must have as its principal focus the betterment of all the people of the Middle East, and not accept the continued decline in the standard of living just to ensure the frustration of Turkey. The increased economic and political influence Turkey would accrue through the increased utilization of its water resources, could provide a healthy balance to the oil derived wealth of the region.

## **Chapter 8**

### **National Security Implications**

While it is indisputable that the shortage of water throughout the Middle East is a source of considerable economic and human angst, there have been a number of authors who have recently begun to question the issue as a precipitator of war in the region. Disregarding the numerous historical vignettes that could be offered to counter this somewhat revisionist view, this researcher chose to turn to the public statements of three renowned, regional peacemakers. Secretary General of the UN, Boutros-Ghali, when finance minister of Egypt, King Hussein of Jordan, and President Anwar Sadat of Egypt all stated that water is the single issue that could still force their respective countries to war.

The Middle East is a region in flux, much as Europe after the fall of the Berlin Wall and all that event symbolized. Significant progress has been made in the peace process involving Israel, Jordan, and the Palestinians. Long contested territories are being returned to previous occupants. Syria was a participant in the US lead coalition against Iraqi aggression, and has continued more open dialogue with the western world than has been seen for many years. All of these changes are certainly headed in positive directions, but again we can look to the recent European experience to note that many of these changes bring with them a certain degree of instability. Syria is arguably more interested

in participating in the world community with the demise of the Soviet Union, which was its principle arms supplier. However, any opening of the Syrian society may well endanger the status of the current ruling party which constitutes less than 15 percent of the population.

Turkey has seen a loss in its position of importance within NATO with the demise of the Soviet threat. When coupled with its continued frustration with acceptance in the European Union, and its internal domestic and political problems, one again sees a country that has lost some of its stability. Egypt is also a nation in crisis between runaway population growth, and domestic unrest sponsored by a growing Islamic radical movement fed by continuing economic difficulties.

Even the seemingly positive events surrounding the likely return of the Golan Heights have serious stability repercussions. Recent debate in Israel has surfaced the consideration that the withdrawal from the Heights will slash the available warning time should Syria take offensive action against Israel. The net effect of this lost reaction time may put tremendous pressure on Israel to take preemptive action even while Syrian actions are subject to interpretation.<sup>1</sup>

The Middle East is a region so critical to the world economy, and so politically charged, it only makes sense for the US to adapt policies which reduce opportunities for misunderstanding, and improve opportunities for economic advancement of the citizenry. Clearly, the competition over scarce water resources in such an arid region qualify for our most serious consideration.

With the long abiding national security interest of the United States in the Middle East, it thus seems appropriate to examine possible courses of action, that could assist in

the amelioration of water induced tensions. At the risk of disappointing the American proclivity for near-term quantifiable solutions, I will offer suggestions that focus upon long term reductions in the three major barriers to progress: population, utilization, and supply.

## **Population**

It appears to be widely accepted in the social sciences that the key to long-term population control is education; specifically, the education of the female portion of the population. While it is arguably correct that there is nothing proscriptive in the Koran or Islamic Law regarding birth control measures; and, in fact, the ayatollahs in Iran have started to actively promote birth control, it is still in direct conflict with the prevailing male tradition of establishing community standing by begetting a large family. Thus, while the promulgation of information and supplies necessary for the implementation of modern birth control measures should not be abandoned, they should be made available in a manner that is respectful of, and consistent with, local customs. As a pure distracter, there are those, to include the editorialist Steve Forbes, who argue that there is no evidence to support population growth as a negative factor in the economic development of nations.<sup>2</sup> That contention notwithstanding, a policy that would significantly expand the opportunities for Middle Eastern women to attend American universities should be pursued. Current experience indicates that the overwhelming majority of such women return to their homeland upon completion of their studies, and become positive agents for change within their families and communities. In this manner the desired outcome of reduced population

growth rates can be achieved without the unwelcomed infliction of western methodology upon the Islamic culture.

### **Utilization**

Currently an overwhelming percentage of the available water resources in the region are expended in agricultural efforts. The massive demands of an agricultural economy in an arid region constitute the principal reason that there is a water shortage in the region. There is no single course of action that will alter this situation within the immediate future, nor is there any realistic expectation that the problem will ever be completely solved based upon any metrics of economic efficiency. Rather, a broad range of near-term, as well as long-term actions is needed to immediately improve the efficiency with which water resources are currently expended on agriculture, and over time to reduce both the number of people involved in the agricultural sector of the economy, as well as the acreage under irrigated cultivation. In recognition of the fact that one of the prime drivers in the efforts of nations in this area to become self-sufficient in food production is the deep, abiding distrust of their neighbors, US policy should be one of encouraging peace and confidence building initiatives in the region. Until some minimum essential level of mutual trust can be engendered in the region, fundamental changes which essentially require one country to depend upon acquiring critical resources from another via the open market, are doomed to failure. Current peace initiatives in the region offer an excellent opportunity to initiate the process. Israel is arguably the most advanced nation in the world in the application of sophisticated micro-irrigation methods. The current peace initiatives, albeit still incomplete, may have progressed sufficiently that when coupled with pending agricultural

disaster, the Islamic nations may be willing to learn from their Jewish neighbors. The sharing of Jewish technology in computer controlled, micro-irrigation, water recycling for agricultural use, as well as saline water tolerant plant strain development, could clearly be a boon to the entire region. The potential for confidence-building measures with the provision of such tangible and essential assistance could go a long way to improving the prospects for peace in the region.

### **Supply**

Clearly, the supply side of the water equation can be increased throughout the Middle East, but a regional perspective must be adopted, and serious efforts initiated to provide exogenous funding sources. Pearce does an excellent job of reminding us of collection, capture, and redirection methods ancient civilizations developed to adapt to the seasonal nature of rainfall in the region.<sup>3</sup> Yet today much of the seasonal rainfall in the area is lost due to a lack of catchment capacity. It would appear that the first imperative is to determine where seasonal deluges are most out of alignment with catchment capacity, and focus resources on developing the appropriate dams, canals, and reservoirs to capitalize on this fleeting resource. Certainly this requirement was driven home to the Syrians and Iraqis when Turkey increased the flow of the Euphrates river for a month prior to severe flow constriction to fill the Ataturk Dam reservoir. Since both nations lacked the necessary dams at the northernmost borders of their countries, the additional water flow simply passed through the countryside. The significant capital investments required for these projects are certainly beyond the near-term financial capacity of the countries involved. The US policy should be one of encouraging the World Bank, countries such as

Japan who have vital national interests in the preservation of peace in the region, and other international organizations to underwrite the considerable infrastructure investments required to bring into being the system of water projects necessary for economic and political harmony in the region.

#### Notes

<sup>1</sup>DejaNews from Internet dated 12/12/95 "Golan Myth & Facts" by Aaron Lerner 10 December 1995.

<sup>2</sup>Malcom S. Forbes Jr., "The world is overpopulated, Not," editorial, *Forbes* 149 (8 June 1992): 25.

<sup>3</sup>Fred Pearce, "Ancient lessons from arid lands," *New Scientist* 132 (December 7 1991): 42.

## Chapter 9

### Closure

As clearly the most insightful author encountered in researching the issue of water in the Middle East, it seems fitting to close with the opening statement from Hillel's *Rivers of Eden*:

The good of the region and all the people demands a new approach. Cognizant of the past, but not bound by it, aware of the deprivations and grievances of the present, but not obsessed by them. Needed above all is a forward-looking vision of the region's potential strengths and positive destiny, attainable in a context of international cooperation.<sup>1</sup>

#### Notes

<sup>1</sup>Daniel Hillel, *Rivers of Eden: The Struggle for Water and the Quest for Peace in the Middle East* (New York: Oxford University Press: 1994), 220.



## ***Bibliography***

- Amery, Hussein A. "The Litani River of Lebanon," *The Geographic Review* 83 (July 1993): 229.
- DejaNews from internet dated 12/12/95 "Golan Myth & Facts," by Aaron Lerner, 10 December 1995.
- Forbes Malcom S. Jr., "The world is overpopulated, Not," editorial, *Forbes* 149 (8 June 1992): 25.
- Garfinkle, Adam, *War, Water, and Negotiations in the Middle East: The Case of the Palestinian-Syrian Border, 1916-1923*, (Tel Aviv University, 1993) [book review by Elizabeth Picard, *Middle Eastern Studies*, 31 (April 1995): 404-406].
- Gleick, Peter H. "Water, War & Peace in the Middle East," *Environment* 36 (April 1994): 6-41.
- Helm, Sarah. "Mideast Water Wars," *World Press Review* 42 (January 1995): 37-39.
- Hillel, Daniel. *Rivers of Eden: The Struggle for Water and the Quest for Peace in the Middle East* (New York, Oxford University Press 1994).
- Hillel, Daniel, *Rivers of Eden: The Struggle for Water and the Quest for Peace in the Middle East*, Oxford University Press: 1994 [book review by Ziauddin Sardar "Cruising for Peace" *Nature* 9 (Feb 1995): 483-484].
- Howell, Paul, Lock, Michael and Cobb, Stephen, editors, *The Jonglei Canal: Impact and Opportunity*, (Cambridge University Press, 1989) [book review by H.R.J. Davies, *Geographical Journal* 155 (Nov 1989): 405].
- "Iraq's Water Systems Still in Shambles," *U.S. Water News*, October 1992.
- Kolars, John F. and Mitchell, William A., *The Euphrates River and the Southeast Anatolia Development*. (Carbondale: Southern Illinois University Press, 1991). [book review by Howard A. Reed, *Middle East Journal* 46 (Winter 1992): 115].
- Kolars, John F. and Mitchell, William A., *The Euphrates River and the Southeast Anatolia Development*. (Carbondale: Southern Illinois University Press, 1991). [book review by Will D. Swearingen, *The Geographical Review* 83 (January 1993): 94-95].
- "Mesopotamian Mists," *The Economist* 324 (July 25, 1992): 52.
- "The New Politics of Thirst." *World Press Review* 39 (November 1992): 18-20.
- Pearce, Fred, "Ancient lessons from arid lands," *New Scientist* 132 (December 7 1991): 42-46.
- Pearce, Fred, "Raising the Dead Sea," *New Scientist* 147 (22 July 1995): 32-37.
- Ploss, Irwin and Rubinstein, Jonathan , "Water for Peace, an unlikely Mideast gambit," *The New Republic* 207 (September 7, 1992): 20-22.
- Reitman, Valerie, "Future Mideast Stability May Depend on Supply of Water Rather Than Oil," *Journal of Commerce and Commercial* 387 (February 22, 1993): 483-484.
- Stutz, Bruce, "Water & Peace," *Audubon* 96 (September-October 1994): 64-80.

- Swartz, Avonna Kessler, "Changing the World Around Them: A Letter from Turkiye's Harran Plain." *Social Education* 56 (January 1992): 6-7.
- Vesilind, Priit J. "Water, The Middle East's Critical Resource," *National Geographic* 183 (May 1993) 38-70.